MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

DEE5026 – ELECTRONICS 2

(Diploma in Electronics Engineering)

9 MARCH 2020
2:30 PM – 4:30 PM
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages excluding the cover page with 2 questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided.

QUESTION 1 [50 marks]

(a) Illustrate (by word) the operation of n-channel JFET with the aid of its design structure diagram. (11 marks)

(b) Interpret the following amplifier noise:

(i) Thermal Noise (3 marks)

(ii) Shot Noise (3 marks)

(c) Figure 1 below shows a self-biased configuration circuit of a FET transistor.

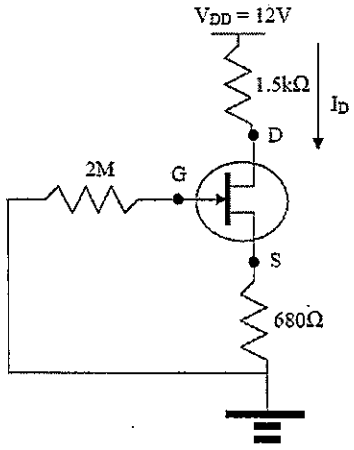

Figure 1

Given maximum drain current, I_{DSS} is 12 mA and pinch-off voltage, V_p is -6V.

Based on the Figure 1, predict the following values:

(i) V_{GSQ} and I_{DQ} (7 marks)

(ii) V_D and V_S (4 marks)

Continued ...

(d) Figure 2 shows a high frequency amplifier circuit for Field Effect Transistor. The circuit has a $R_G = 1\ \text{M}\Omega$, $R_S = 100\ \text{k}\Omega$, $Z_L = 10\ \text{k}\Omega$ and it can operate up to 35 kHz. The coupling capacitors have large values of capacitance. The other parameters are $g_m = 5$ mA/V, $r_d = 50\ \text{k}\Omega$, $C_{gs} = 3$ pF, $C_{ds} = C_{gd} = 1$ pF. Assume $C_{Sn} = 1$ pF.

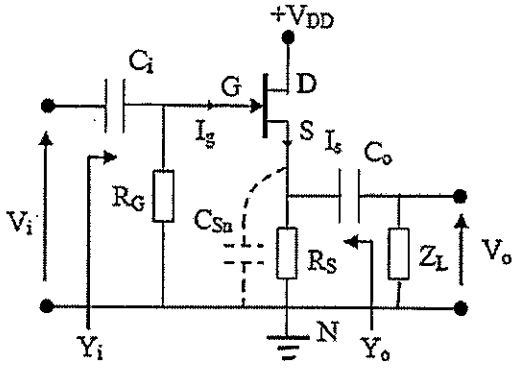

Figure 2

Answer the following:

(i) Identify the type of the amplifier in Figure 2 (1 mark)

(ii) Illustrate (by word) the Miller Theorem and state its purpose. (4 marks)

(iii) Sketch the high frequency model based on Figure 2 after applying Miller's Theorem (4 mark)

(iv) Magnitude of Voltage gain, $|A_v|$ (5.5 marks)

(v) Admittance, Y_A (3 marks)

(vi) Input impedance, Z_i (4.5 marks)

Hint:

$G = 1/R$, $Y = j\omega C$, $g = 1/r$ $Y = 1/Z$

$Y_A = Y(1 - A_v)$, $Y_B = Y(1 - 1/A_v)$, $Y_i = G_G + Y_{gd} + Y_A$

$$A_V = \frac{g_m + Y_{gs}}{Y_{gs} + g_m + g_d + Y_{ds} + Y_{Sn} + G_S + Y_L}$$

Continued ...

QUESTION 2 [50 marks]

(a) Illustrate (by word) the signal of ALL types for the classification of the power amplifiers and sketch its output waveform respectively. (12 marks)

(b) Explain the purpose of the power amplifier. (2 marks)

(c) Sketch the output waveform of the astable, monostable and bistable multivibrators. Briefly explain the concept of the stable output states of these multivibrators. (6 marks)

(d) Describe the relationship between the input and output of a Schmitt Trigger circuit with aid of a proper waveform. (5 marks)

(e) For the operating power amplifier circuit as shown in Figure 3, answer the following:

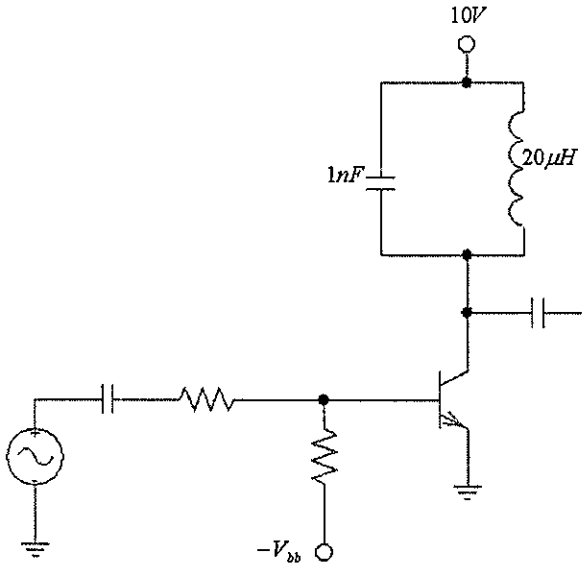

Figure 3

(i) Identify the type of the amplifier (1 mark)

(ii) Calculate the resonant frequency. (2 marks)

(iii) If the coil has a resistance of 15 Ω, predict the quality (Q) value. (2 marks)

Continued ...

(f) Figure 4 shows an output waveform of an amplifier.

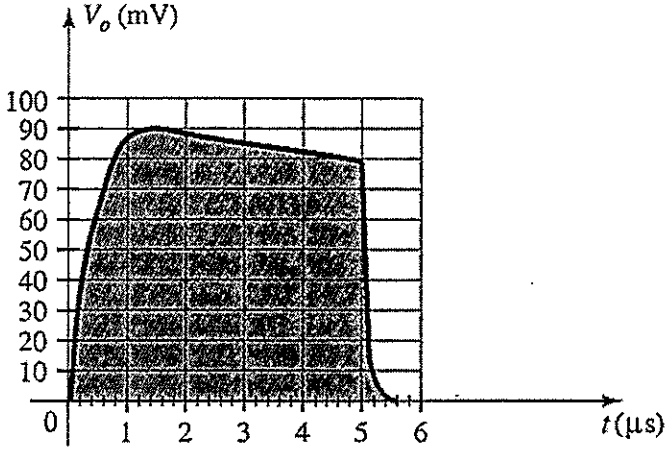

Figure 4

The input of the amplifier is a 20 mV, 180 kHz square wave signal. Based on Figure 4, predict the values of the following parameters:

(i) Upper cutoff frequency (5 marks)

(ii) Lower cutoff frequency (4 marks)

(g) Figure 5 shows an astable multivibrator using a 555 IC which produces 5 kHz output with 85% duty cycle. Assume $C_1 = 100$ nF. Determine the following:

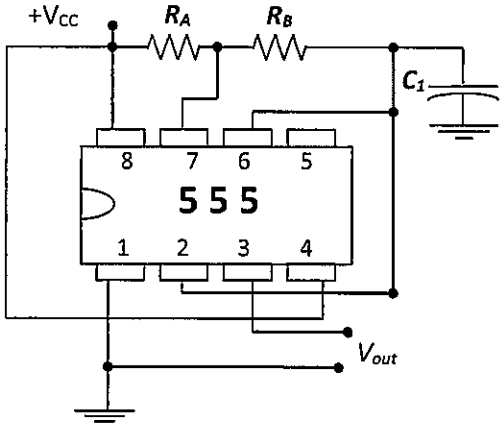

Figure 5

(i) R_A and R_B (7 marks)

(ii) Based on the answer in (i), show the values of pulse width and space width. (4 marks)

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